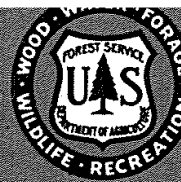


RESEARCH NOTE

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TREAT STUMPS TO PREVENT FOMES ANNOSUS IN
SHORTLEAF PINE PLANTATIONS

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Fomes annosus (Fr.) Cke. is a fungus that causes a serious root and butt rot of pines and other conifers throughout the world. All of our native conifers are probably susceptible so the many old-field plantations in the Central States and elsewhere are threatened.

F. annosus frequently becomes established when a healthy stand is thinned. Airborne spores of the fungus are deposited on freshly cut stump surfaces. After spores germinate, the fungus grows down the stump, out along the roots, to the roots of healthy trees that are in contact. More and more trees become diseased as the infection center gradually enlarges. The average growth rate of the fungus in the roots is about 3 feet a year so mortality from F. annosus does not show up until 2 or 3 years after thinning. Once tree roots become infected, the fungus may survive below ground for 50 years or more. The fungus can also live for many years as a saprophyte on dead trees, stumps, and cull logs of certain hardwoods as well as conifers.

Since most infection appears to begin at freshly cut stumps, here would seem to be a good place to employ some sort of chemical treatment for control.

THE STUDY

In 1962 and 1963 we investigated the effectiveness of a number of chemicals in preventing colonization of pine stumps by F. annosus in a 26-year-old shortleaf pine plantation on the Clark National Forest in southern Missouri. Sample trees used in the experiment were cut about 20 inches above the

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ground. We did this to insure that the stump surface would not already be infected, on the assumption that the pathogen is confined to the roots and root collar of live pine trees. Eight different chemicals were tried: urea, ammate, ammonium fluoride, creosote, pentachlorophenol, Borateem, borax, and borax with ethyl alcohol. Ethyl alcohol was added to one borax suspension to lower its freezing point for use in very cold weather. Each chemical was applied to cut surfaces of 20 stumps immediately after felling trees; 20 stumps were left untreated to serve as controls.

Approximately 1 hour after chemicals were applied, surfaces of all stumps were inoculated by atomizing them with a suspension of F. annosus conidia in distilled water.

After an incubation period of 3 months we sawed off sections about 2 inches thick from the tops of the stumps, enclosing each section in a polyethylene bag, and incubating at room temperature. In about a week the sections were examined under a microscope for signs of the fungus. Then the sections were split and small chips of wood removed aseptically from the split surfaces and placed in sterile malt-agar slants. After incubation at room temperature for 6 or 7 days, the slants were inspected for colonies of F. annosus.

RESULTS AND DISCUSSION

Ninety-five percent of the control stumps became infected (table 1). Urea was the only material that gave absolute protection. All the others gave partial protection with creosote and pentachlorophenol being the least effective.

The various chemicals differ in the way they prevent or reduce stump colonization by F. annosus. Urea, ammate, and ammonium fluoride--compounds high in nitrogen--stimulate the growth of other fungi (e.g., Peniophora gigantea (Fr.) Masee and Trichoderma spp.) that are antagonistic to F. annosus. The borate compounds, borax and Borateem, are toxic to the fungus spores, while creosote and pentachlorophenol act as a barrier to spore germination.

Based on British experience, creosote has, until recently, been recommended for control of F. annosus in this country but our results indicate that other materials are more effective. We recommend agricultural grade urea containing 45 percent nitrogen, or one of the borate compounds because they

Table 1.--Effect of chemicals on infection of shortleaf
pine stumps by Fomes annosus (Fr.) Cke.

Material	Composition (by weight)	Protection :(stumps not infected) Percent
Urea (technical grade)	20% in water ^{1/}	100
Ammate	40% in water	95
Ammonium fluoride (technical grade)	5% in water	95
Borateem (sodium tetra- borate decahydrate)	10% in water	95
Borax (technical grade sodium tetraborate decahydrate)	10% in water	90
Borax (technical grade sodium tetraborate decahydrate) + ethyl alcohol	10% borax + 35% ethyl alcohol in water	85
Creosote	100% creosote	70
Pentachlorophenol	5% in light oil	65
Inoculated control	---	5

^{1/} Urea was used as a 20 percent solution of the 45 percent technical grade material.

are cheap, readily available, and easy to apply. F. annosus damage is much more serious in thinned pine plantations than in natural pine stands. When thinning natural pine stands, therefore, stump treatment is probably not justified.

Since stump treatment can only protect stands against initial invasion by F. annosus, it is important that stumps be treated after each thinning, beginning with the first. If F. annosus infection is already present, stump treatment is not warranted. Once the disease is established in an area, its spread cannot be prevented.

The time is rapidly approaching when most of the pine plantations in the Central States must receive their first thinning. If precautions against F. annosus infection such as we are suggesting are not taken at that time, this disease will become increasingly destructive.

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